

ABSTRACT

Apparatus and methods are described for effective removal of emboli or harmful fluids during vascular procedures, such as angiography, balloon angioplasty, stent deployment, laser angioplasty, atherectomy, intravascular ultrasonography and other therapeutic and diagnostic procedures. A catheter with an occluder mounted at its distal end creates an occlusion proximal to the lesion. The catheter provides a pathway for introducing a treatment catheter. Prior to, during or subsequent to the procedure, suction is activated to establish retrograde flow to remove emboli from the site. Additionally, a thin catheter with a distal fluid ejection nozzle may be introduced distal to the treatment site to rinse emboli from the treatment site. The suction flow and/or ejected fluid flow may be varied in a pulsatile manner to simulate regular blood flow and/or perturb settled emboli into being captured that may otherwise not be collected. The method establishes a protective environment before any devices enter the site to be treated.